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Predictors of Pre-Exposure Prophylaxis (PrEP) Uptake and Continuity Among Adults at Risk of HIV: A Mixed-Methods Study in Kisumu County, Kenya

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Abstract: Background: HIV/AIDS remains a significant public health challenge in Kenya, particularly in high-burden regions like Kisumu County. While Pre-exposure Prophylaxis (PrEP) is a highly effective prevention tool, its success is limited by barriers to both initial initiation and long-term retention. This study aimed to identify the socio-demographic, economic, and behavioural predictors of PrEP uptake among naïve individuals and continuity among experienced users. Methods: An analytical mixed-methods cross-sectional study was conducted in January 2024 across four sub-counties in Kisumu. A total of 435 participants (358 PrEP-naïve and 77 PrEP-experienced) were recruited from high-volume health facilities via systematic random sampling. Quantitative data from structured questionnaires were analyzed using STATA 17, while qualitative data from twelve key informant interviews with healthcare providers were analyzed thematically using NVivo 12. Results: Among PrEP-naïve respondents, 88.12% were willing to initiate PrEP. Significant positive predictors of uptake included being a student (OR=3.882, p<0.001), while rural residence (OR=0.432, p=0.005) and primary education (OR=0.511, p=0.018) were significant barriers. Among experienced users, 46.15% had discontinued PrEP. Predictors of continuity included marital status, where never-married individuals had 77% lower odds of staying on PrEP (OR=0.227, p=0.003). Key reasons for discontinuation were low HIV risk perception (61.11%), side effects, and relocation. Conclusion: High initial willingness is undermined by structural and socio-behavioural barriers to continuity. HIV prevention programs should prioritize partner-based support, side-effect management, and flexible delivery models to improve retention in high-burden counties.

Introduction

The HIV/AIDS epidemic has remained one of the most significant global health crises since its emergence in the 1980s. While advancements in antiretroviral therapy (ART) have transformed HIV into a manageable chronic condition, transmission rates remain high in specific geographic "hotspots". Sub-Saharan Africa continues to bear the disproportionate brunt of the epidemic, accounting for approximately 67% of the 37.7 million people living with HIV globally as of 2020 [1-3]. In Kenya, the national HIV prevalence stands at approximately 4.9%, but this figure masks deep regional inequalities. The Lake Victoria region, including Kisumu County, reports prevalence rates significantly higher than the national average. In 2020, Kisumu County was home to an estimated 112,561 adults living with HIV. To combat this, the Kenyan government, in alignment with global targets, has scaled up Pre-exposure Prophylaxis (PrEP). PrEP involves the use of antiretroviral medication by HIV-negative

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individuals to reduce the risk of infection by over 90% when taken as prescribed [4,5]. Despite the availability of PrEP, the "prevention cascade" faces two critical failure points: uptake (the transition from being at risk to starting the medication) and continuity (the ability to remain on the medication during periods of risk). Current literature suggests that while awareness is growing, actual uptake remains low among certain demographics, and discontinuation rates are alarmingly high, often exceeding 50% within the first six months of initiation. Barriers such as stigma, "pill fatigue," relocation, and inaccurate risk perception have been suggested as contributing factors, yet few studies provide a comprehensive view of both the naïve and experienced populations within the same high-burden context [6]. This study addresses this gap by investigating the predictors of both PrEP uptake and continuity among adults in Kisumu County, Kenya.

2.0 METHODOLOGY

2.1 Study Design and Setting

This study employed an analytical mixed-methods cross-sectional design to capture both the statistical predictors of PrEP use and the nuanced experiences of healthcare providers. The study was conducted in January 2024 within Kisumu County, specifically targeting four sub-counties: Kisumu Central, Kisumu East, Kisumu West, and Nyando. These areas represent a mix of urban, peri-urban, and rural populations, providing a diverse sample of the county's demographic profile.

2.2 Sampling and Participants

The study population consisted of adults aged 18 years and older who were either PrEP-naïve (eligible for PrEP but not yet enrolled) or PrEP-experienced (currently or previously enrolled). While the initial target was 422, the final sample size achieved and analyzed was **435** participants, representing a response rate of **103.1%**. Participants were recruited from four high-volume health facilities: Gita Sub-county Hospital (Kisumu East), Kisumu County Hospital (Kisumu Central), Chulaimbo County Hospital (Kisumu West), and Ahero County Hospital (Nyando). Systematic random sampling was used to select participants at the facility level, ensuring every k^{th} individual attending the outpatient department was invited to participate. The sampling intervals for each facility in the study were as follows: For **Gita Sub County Hospital**, the study team invited every **17th individual** who met the inclusion criteria to participate. At **Ahero County Hospital**, the systematic approach involved selecting every **6th individual**. For **Chulaimbo County Hospital**, the interval was set to every **11th individual**. Finally, at **Kisumu County Referral Hospital**, which had the highest patient volume, the team sampled every **3rd individual**. The variation in the kth (sampling interval) values across the four study sites was primarily driven by the need to achieve a representative, predetermined sample size within a fixed data collection period, despite significant differences in patient flow at each facility.

The specific rationale for this variation includes:

Proportionality to Patient Volume: The k value was mathematically derived by dividing the average monthly outpatient department (OPD) attendance of a facility by its specific study target. For instance, the **Kisumu County Referral Hospital** had a very high monthly volume of 9,834 patients, requiring a frequent sampling interval of every **3rd individual** to capture its target of 101 participants.

Targeted Representation: Each facility was assigned a specific "Study target per facility" to ensure the final sample of 435 was geographically and demographically balanced across the four sub-counties. Facilities with smaller targets and lower volumes, such as **Gita Sub County Hospital**, utilized a wider interval of every **17th individual** to spread the recruitment over the entire study duration.

Standardization of Time: By adjusting the k value based on the "Daily average patients" and "Daily target," the researchers ensured that data collection could proceed simultaneously across all sites and conclude within the same timeframe (January 2024), regardless of whether a site was a high-traffic urban center or a lower-volume rural facility.

Reduction of Selection Bias: Using a site-specific systematic interval, rather than a flat interval for all sites, minimized the risk of over-sampling from high-volume facilities or under-sampling from lower-volume ones, thereby

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maintaining the scientific integrity of the systematic random sampling approach.
For the qualitative arm, purposive sampling was used to select twelve key informants, including clinical officers, nurses, and pharmacists directly involved in PrEP service delivery.

2.3 Data Collection and Analysis
Quantitative data were collected using structured, pre-tested questionnaires. The instrument achieved a Cronbach's alpha of 0.814, indicating high internal consistency. Questions covered socio-demographic characteristics [8], economic status, HIV risk behaviours, and specific attitudes toward PrEP. Qualitative data were collected through semi-structured key informant interview guides. Quantitative analysis was performed using STATA version 17. Descriptive statistics (frequencies and percentages) summarized the data, while binary logistic regression identified significant predictors of uptake and continuity. Qualitative data were transcribed verbatim and analyzed using a thematic approach assisted by NVivo 12 software.

2.4 Ethical Considerations
The study received ethical clearance from the Mount Kenya University Institutional Scientific and Ethical Review Committee (MKU/ISERC/3374) and research authorization from the National Commission for Science, Technology, and Innovation (NACOSTI/281606). All participants provided written informed consent prior to data collection, and confidentiality was maintained throughout the study.

3.0 RESULTS
3.1 Socio-Demographic Profile
The total sample of **435** participants was predominantly female (**73.79%**), which reflects the higher health-seeking behaviour of women in the region. The majority of participants were married (**63.27%**) and had completed at least a secondary level of education (**51.66%**). Economic indicators pointed to significant hardship, with **64.22%** of the sample earning less than 5,000 KES per month.

Table 1: Socio-demographic characteristics of the participants (N=435)

Variable	Category	Frequency	Percentage (%)
Sex	Male	114	26.21
	Female	321	73.79
Marital Status	Married	275	63.27
	Single/Never Married	118	27.25
	Divorced/Widowed	42	9.48
Education	Primary	105	24.17
	Secondary	225	51.66
	Tertiary	105	24.17
Income (KES)	< 5,000	279	64.22

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	5,001 – 10,000	101	23.22
	> 10,000	55	12.56
Residence	Urban	231	53.08
	Rural	204	46.92

3.2 Predictors of PrEP Uptake (PrEP-Naïve Arm)

Among the **358** PrEP-naïve participants, willingness to initiate PrEP was high at **88.12%** (**n=315**). However, logistic regression revealed that several factors significantly hindered or facilitated this willingness. Being a student was the strongest positive predictor, while rural residence and lower education levels significantly reduced the odds of uptake.

Table 2: Logistical regression for socio-demographic predictors of PrEP uptake (n=358)

Variable	Category	Odds Ratio (OR)	95% Conf. Interval	P-value
Residence	Rural (vs. Urban)	0.432	0.239 – 0.779	0.005
Education	Primary (vs. Secondary)	0.511	0.293 – 0.892	0.018
Occupation	Student	3.882	1.838 – 8.201	<0.001
Occupation	Self-Employed	1.694	1.011 – 2.842	0.047
Social Support	Discussed PrEP with associates	0.481	0.241 – 0.961	0.038

3.3 Predictors of PrEP Continuity (PrEP-Experienced Arm)

Of the **77** experienced users, **46.15% (n=36)** reported having discontinued PrEP at some point during their enrollment. Analysis showed that social and structural factors were the primary drivers of continuity.

Table 3: Determinants of PrEP Continuity among experienced users (n=77)

Variable	Category	Frequency	Percentage (%)	P-value
Marital Status	Married	52	67.53	0.007
	Never Married	25	32.47	
Partner Support	Support for enrollment	43	55.84	0.012
	No support	34	44.16	
Sub-County	Kisumu Central	24	31.17	0.016

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	Kisumu East	19	24.68	
	Kisumu West	18	23.38	
	Nyando	16	20.78	
Continuity	Still on PrEP	41	53.85	—
	Discontinued	36	46.15	

Table 4: Economic and Occupational predictors of Continuity (n=77)

Predictor	Odds Ratio (OR)	95% Conf. Interval	P-value
Informally Employed	0.222	0.053 – 0.929	0.040
Self-Employed	0.272	0.078 – 0.947	0.041
Student Status	0.130	0.024 – 0.702	0.019
Never Married	0.227	0.078 – 0.658	0.003

3.4 Reasons for Discontinuation and Healthcare Provider Insights

Participants who stopped taking PrEP provided various reasons, primarily focused on risk perception and the physical burden of the medication.

Table 5: Reasons for PrEP Discontinuation (n=36)

Reason	Frequency	Percentage (%)
Low HIV Risk Perception	22	61.11
Partner Influences	4	11.11
Pill Burden/Fatigue	3	8.33
Other Reasons	3	8.33
Side Effects (Nausea/Dizziness)	2	5.56
Relocation/Transfer	2	5.56

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Qualitative interviews with twelve healthcare providers revealed that while PrEP is available, clients often struggle with "secretive use" if they have not disclosed to their partners. Providers noted that many clients stop PrEP once they perceive their partner has achieved viral suppression (if in a discordant relationship) or if they move to a different sub-county where they are not registered for refills.

4.0 DISCUSSION

This comprehensive analysis reveals a significant "PrEP Gap" in Kisumu County: the transition from high initial willingness (**88.12%**) to successful long-term continuity (**53.85%**) is fraught with structural and social barriers.

Uptake and Willingness: The high willingness among students (**OR=3.882**) suggests that HIV prevention literacy is high within academic environments, possibly due to campus-based health initiatives. This aligns with Tao et al. [24], who noted that peer-driven interventions significantly increased PrEP uptake willingness among young adults. However, our findings contrast with this positivity in rural areas, where residents had **57%** lower odds of uptake (**OR=0.432**). This supports the "geographic disadvantage" theory presented in the NASCOP 2021 estimates [3], suggesting that rural populations face higher barriers to entry, including distance to health facilities.

The Fragility of Continuity: The **46.15%** discontinuation rate is a major concern for the biomedical HIV prevention era [12]. The most striking finding is the role of marital and partner dynamics. Never-married individuals had **77%** lower odds of continuity (**OR=0.227**) compared to married respondents. This corroborates studies by Baeten et al. [15] and Thigpen et al. [20], which highlighted that in heterosexual contexts, partner disclosure is the strongest predictor of adherence. When a partner supports the decision, the stigma of "taking a daily pill" (which can be mistaken for HIV treatment) is neutralized.

Risk Perception and Adherence: The fact that **61.11%** of those who discontinued cited "low risk perception" agrees with regional studies in Western Kenya by Kamire et al. [22] and Owino et al. [23]. These studies found that risk perception among youth and adults is often episodic. Participants tend to stop PrEP when they are not in an active sexual relationship or when they believe their partner is "safe". This episodic use is risky in general populations where consistent use is the standard of care.

Structural Barriers: Economic status was a significant predictor, with informally employed individuals **78%** less likely to continue PrEP (**OR=0.222**). The opportunity cost of spending a day at a clinic for a refill is high for those earning less than 5,000 KES per month. Relocation (**5.56%**) also emerged as a barrier, suggesting the current facility-linked refill system is not flexible enough for a mobile workforce.

5.0 CONCLUSION AND RECOMMENDATIONS

While PrEP awareness has successfully permeated the Kisumu population, leading to high willingness to uptake, retention remains a critical challenge. The findings emphasize that HIV prevention is not just a clinical issue but a social and economic one. To bridge the gap, the following is recommended:

1. **Partner-Inclusive Models:** Programs should shift from individual-focused to partner-focused counselling to foster supportive home environments.
2. **Decentralized Refills:** Implementing multi-month dispensing and community-based refill points would reduce the economic burden on low-income and mobile workers.
3. **Risk Literacy:** Education campaigns must clarify that PrEP is a proactive maintenance tool, addressing fluctuating risk perceptions that lead to premature discontinuation.

6.0 Author Contributions

MAS conceived and designed the study, performed data collection, conducted statistical analysis, and drafted the manuscript. AOO and SMM provided study design revision and oversaw analysis. AM contributed to qualitative thematic analysis and editing. FOO provided administrative support and critically reviewed

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the manuscript. All authors approved the final version.

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